

ABSTRACT OF THE DISCLOSURE

An interconnect structure and fabrication method are provided to form air gaps between interconnect lines and between interconnect layers. A conductive material is deposited and patterned to form a first level of interconnect lines. A first dielectric layer is deposited over the first level of interconnect lines. One or more air gaps are formed in the first dielectric layer to reduce inter-layer capacitance, intra-layer capacitance or both inter-layer and intra-layer capacitance. At least one support pillar remains in the first dielectric layer to promote mechanical strength and thermal conductivity. A sealing layer is deposited over the first insulative layer to seal the air gaps. Via holes are patterned and etched through the sealing layer and the first dielectric layer. A conductive material is deposited to fill the via holes and form conductive plugs therein. Thereafter, a conductive material is deposited and patterned to form a second level of interconnect lines.